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## MEDICATION ADMINISTRATION VIA ENTERAL FEEDING TUBE: A SURVEY OF PHARMACISTS' KNOWLEDGE

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**KEYWORDS:** pharmacist; knowledge; medication administration; enteral feeding tube; Belgium

## **ABSTRACT**

### **Background**

Medication administration to patients with an enteral feeding tube (EFT) is complex and prone to errors. Community pharmacists may be ideally placed to provide training and advice on this topic in individual patients as well as in institutions supplied by the pharmacy.

### **Objective**

To assess community pharmacists' knowledge on guideline recommendations regarding medication preparation and administration through EFT.

### **Method**

Knowledge of guideline recommendations was assessed using a 15-item self-administered online questionnaire (April – June 2014). Questions reflected key aspects of guideline recommendations on medication administration via EFT. All graduated community pharmacists from the Dutch-speaking part of Belgium were eligible for participation.

### **Results**

A total of 105 community pharmacists completed the questionnaire. Median self-perceived knowledge of medication administration via EFT was 2 (on a 0-10 scale). On average 5.2 (SD 2.6) out of the 15 questions were answered correctly. Strikingly, the ability to select suspensions in a list of liquid medications and knowledge on crushability of solid dosage forms were low.

### **Conclusion**

Our findings demonstrate that pharmacists' knowledge on correct medication administration via EFT is too limited to be able to provide good advice to EFT patients or their caregivers. Tailored training on this topic is needed.

## **IMPACT OF FINDINGS IN PRACTICE**

- Community pharmacists' knowledge related to medication administration through EFT was poor.
- Community pharmacists' potential as adviser on medication administration practices via enteral feeding tube can be fully utilized only when tailored training on this topic is provided.

## **INTRODUCTION**

Medication administration through an enteral feeding tube (EFT) is prone to errors such as inappropriate dosage form selection, crushing non-crushable drugs, and wrong administration techniques. These errors can lead to reduced drug efficacy, increased adverse effects, and tube obstruction (1). To reduce these risks, guidelines for the safe administration of drugs via EFT have been available for many years (1;2). Because of the frequent patient contacts upon prescription filling and because of their specific medication-related expertise concerning drug formulations, adverse effects, etc., community pharmacists may be ideally placed to provide training and advice in the application of these guidelines in individual patients as well as in institutions supplied by the community pharmacy. However, there are currently no data available on the actual level of knowledge about drug administration through EFT among community pharmacists. This is important as this determines the quality of their advice.

## **AIM OF THE STUDY**

The present study aims to investigate community pharmacists' knowledge on current international guidelines for medication administration via EFT.

## METHOD

### STUDY DESIGN AND PARTICIPANTS

This observational questionnaire study was carried out from April to June 2014 in Belgium. All graduated community pharmacists from the Dutch-speaking part of Belgium were eligible for participation. Consent to participate was indicated by completion of the questionnaire.

### DATA COLLECTION

A 15-item self-administered questionnaire was developed by two pharmacists and a fourth-year pharmacy student (SV). Each question reflected a key point from the guideline recommendations on medication administration via EFT (1;2) (Table 1).

The questionnaire was pilot tested with three community pharmacists. In addition to the guideline-related items, background information on the participating pharmacists was collected (gender, age, work experience, whether they are consulted by patients with EFT, whether they deliver medication to residential care facilities (RCF) for individuals with intellectual disability who also have EFT, and whether they received postgraduate training concerning medication administration via EFT). Participants were also asked to rate their self-perceived level of knowledge on medication administration via EFT on a scale of 0 (= no knowledge) to 10 (= excellent knowledge). At the end of the questionnaire each participant had to indicate whether he had used information sources during completion. The questionnaire was made electronically accessible using Qualtrics software (Qualtrics Inc., Provo, UT). All five local pharmacists' professional organisations were asked to forward an e-mail to their members describing the purpose of the study and including a web link to the questionnaire (a total of approximately 4470 pharmacists).

### DATA ANALYSIS & STATISTICAL ANALYSIS

For each item of the questionnaire, the number of participants answering correctly was determined. For questions with more than one correct answer (Q3, Q4, Q5, Q7, Q10, Q14), participants had to find all the correct answers to get the question right. Answers to the open-ended question (Q15)

were categorized. We also calculated a total score per participant by giving one point to each correct response, resulting in a total score ranging from 0 to 15. Descriptive statistical analysis was performed. The effect of participant characteristics on the total score was evaluated using scatter plots for continuous variables (age, work experience, and self-perceived knowledge) and independent sample t-tests for categorical variables (being consulted by EFT patients, postgraduate training received concerning medication administration via EFT, and use of information sources during questionnaire completion). All statistical analyses were performed using SPSS 21.0 for Windows (SPSS Inc., Chicago, IL, USA). A *P* value <0.05 was considered statistically significant.

## RESULTS

One hundred and five pharmacists completed the questionnaire (estimated response rate 2%). The median age of the participating pharmacists was 35 years, with a range of 22-66 years, and 74 of them (70 %) were female. Median years of working experience in community pharmacy was 10 (range 0-42 years). Thirty-three pharmacists (31%) had EFT patients among their patients, and five of these (5/33) also delivered medication to RCFs for people with intellectual disabilities. Only 2 pharmacists (2%) already completed a postgraduate training on medication administration via EFT, 74 pharmacists (70%) perceived a need for training on this topic, and 48 (46%) were willing to give training in RCFs. Median self-perceived knowledge of medication administration via EFT was 2 (on a scale of 0-10 scale)..

From a maximum score of 15, the participating pharmacists obtained on average 5.2 (SD 2.6, range 0.0-12.0) or 35% (SD 18%, range 0%-80%). The proportion of pharmacists answering correctly to the individual questions is shown in Table 1. The guideline recommendations concerning water as the preferred flush solution (Q11) and the preparation of hard gelatin capsules (Q2) were known best. Least known items included: when to flush the EFT (Q10), the minimum recommended backrest elevation (Q13), and recognizing drugs with risk of poor bioavailability when administered through a jejunostomy tube (Q14). No significant differences in total scores were found for the investigated categorical variables (being consulted by EFT patients ( $P=0.159$ ), postgraduate training received concerning medication administration via EFT ( $P=0.212$ ), and use of information sources during questionnaire completion ( $P=0.071$ )), nor did scatter plots show correlation between the continuous variables (age, work experience, and self-perceived knowledge) and total score.

Ten percent of the participants reported to have used information sources during questionnaire completion, which included (i) an online database of the Belgian Centre for Pharmacotherapeutic Information (3) ( $n=4$ ), (ii) an online Belgian database about crushing solid dosage forms (4) ( $n=4$ ), (iii) the DelphiCare® database (a drug information database) (5) ( $n=2$ ), (iv) Summary of Product



Characteristics (n=1), (v) Handbook of Drug Administration via Enteral Feeding Tubes (2) (n=1), and  
(vi) Google (n=1).

## DISCUSSION

### MAIN FINDINGS

Pharmacists' knowledge related to medication administration through EFT was poor. However, participants recognized their lack of knowledge (self-perceived knowledge of 2 on a 0-10 scale). A striking finding is that only a minority of participants was able to select suspensions, which need to be shaken before use to ensure correct dosing, out of a list of commercially available liquid dosage forms. One of the suspensions on this list was the frequently dispensed domperidone suspension Motilium®. Far better, yet still rather low, is the number of participants identifying all non-crushable drugs (i.e. the sustained release dosage forms Depakine Chrono® and Carbamazepine CR®, and the enteric coated Losec Mups®), hence suggesting a limited knowledge on solid dose formulation coding.

### INTERPRETATION OF FINDINGS IN RELATION TO PREVIOUS STUDIES

Our results were comparable to the findings in other settings with other health care professionals where it was reported that acute care nurses (6) and staff members of RCFs for people with intellectual disabilities (i.e. mainly non-medically educated staff) ([removed for blind review]) had insufficient knowledge related to medication administration through EFT as well. In their pre-post study *Dashti-Khavidaki et al.* (6) found that less than one third of the acute care nurses correctly responded to the questions dealing with the recognition of dosage forms, tube flushing, and medication preparation. In our previous study examining knowledge of staff members of RCFs for people with intellectual disabilities ([removed for blind review]) a similar questionnaire was used. When comparing these results with the observation in the present study, pharmacists scored substantially better than RCF staff members on questions related to the crushability of tablets. The most surprising difference, however was that pharmacists scored worse on the question dealing with the identification of suspensions in a list of commercially available liquid dosage forms. Another important difference between these two samples was that, even though total scores were low in

both samples, pharmacists knew they lack knowledge on this topic, whereas RCF staff members thought their knowledge was good.

Previous research in the hospital setting (6;7) and in an RCF for people with intellectual disabilities (8) demonstrated that educational intervention programs that were led by (clinical) pharmacists, improved practice and knowledge of personnel involved in medication preparation and administration to patients with EFT. However, when taking into account the findings of the present study, community pharmacists will need proper training before being able to provide qualitative education and advice on this topic.

#### LIMITATIONS

Main limitation of our study is that only a small number of pharmacists completed the questionnaire. The combination of a typically low response rate to web-questionnaires, the voluntary participation and hence high probability that mainly pharmacists that are interested in this topic participated in the questionnaire, make it difficult to generalise our findings to the wider pharmacist community. However, this limitation suggests that our data reflect an overestimation of knowledge amongst the general population of community pharmacists. Another limitation may be that, compared to the total population of Belgian pharmacists, sex distribution in our sample was similar (70% female vs. 74% in total population,  $P=0.157$ ), but mean age was significantly lower (mean of 37 vs. 44 in the total population,  $P=0.000$ ). Since care for special patient populations has gained more attention in Belgian pharmacy education over the last decade, this adds to the conjecture that pharmacist knowledge is overestimated in this study.

#### CONCLUSION

Our findings demonstrate that community pharmacists' knowledge on correct medication administration via EFT is insufficient to be able to provide good advice to EFT patients or their

caregivers. Tailored training on this topic in both basic and postgraduate training of pharmacists is needed, as well as access to up-to-date and reliable information sources and educational material.

**Conflict of Interest:** The authors declare that they have no conflicts of interest.

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[removed for blind review]

## TABLES

**Table 1** Proportion of pharmacists (n=105) answering correctly to each question. For questions with multiple correct answers (Q3, Q4, Q5, Q7, Q10, Q14), participants had to find all the correct answers to get the question right; the numbers in italic indicate the percentage of participants that ticked the corresponding correct answer option.

| Question  | n (%)   |
|---|---|
| <i>MEDICATION PREPARATION</i>   |   |
| <b>1. If a patient needs to receive multiple drugs at one administration moment, what is the correct procedure?</b><br>a. Prepare the drugs together (e.g. crushing or dissolving together), and administer together<br>b. Prepare the drugs separately; however, they can be mixed just before administration and they can be drawn together into the syringe<br><b>c. Prepare and administer the drugs separately</b><br>d. I do not know | <b>51 (49%)</b>                                     |
| <b>2. Hard gelatin capsules that are not enteric coated, are preferably ..... (complete) before administering through enteral feeding tube</b><br>a. dissolved in water<br><b>b. opened, and the content mixed with water</b><br>c. I do not know   | <b>82 (78%)</b>                                     |
| <b>3. Which of the following liquid dosage forms should be shaken before use? (multiple answers possible)</b><br><b>a. Motilium® (domperidone)</b><br>b. Depakine® (valproic acid)<br>c. Keppra® (levetiracetam)<br><b>d. Tegretol® (carbamazepine)</b><br>e. I do not know   | <b>13 (12%)</b><br>43 (41%)<br>26 (25%)             |
| <b>4. Which of the following tablets should NOT be crushed when administered by gastric feeding tube (multiple answers possible)</b><br><b>a. Depakine Chrono® (valproic acid)</b><br>b. Topamax® (topiramate)<br><b>c. Losec Mups® (omeprazole)</b><br>d. Lioresal® (baclofen)<br><b>e. Carbamazepine CR®</b><br>f. I do not know  | <b>63 (60%)</b><br>81 (77%)<br>70 (67%)<br>83 (79%) |
| <b>5. Which of the following tablets require the use of protective equipment (i.e. mask and gloves) during crushing? (N.B.: All tablets in this question can be crushed) (multiple answers possible)</b><br><b>a. Amoxicilline®</b><br>b. Frisium® (clobazam)<br><b>c. Euthyrox® (levothyroxine)</b><br>d. Risperdal® (risperidone)<br>e. I do not know   | <b>15 (14%)</b><br>24 (23%)<br>37 (35%)             |
| <b>6. Liquid dosage forms should be diluted before administering via enteral feeding tube.</b><br><b>a. Correct</b><br>b. Incorrect<br>c. I do not know   | <b>20 (19%)</b>                                     |

|   |                 |
|---|-----------------|
| <b>7. Which of the following Depakine® (valproic acid) dosage forms is/are preferably used for administration through gastric feeding tube? (multiple answers possible)</b> | <b>65 (62%)</b> |
| a. Depakine Chrono® tablets   |                 |
| <b>b. Depakine® syrup</b>   | <b>72 (69%)</b> |
| <b>c. Depakine® drops</b>   | <b>78 (74%)</b> |
| d. Depakine Enteric® tablets  |                 |
| e. I do not know  |                 |

#### MEDICATION ADMINISTRATION

|   |                 |
|---|-----------------|
| <b>8. Can medication be added directly to an enteral feeding formula?</b>   | <b>30 (29%)</b> |
| a. Yes, all medications can be added directly to an enteral feeding formula   |                 |
| b. Yes; however, not all medications can be added directly to an enteral feeding formula  |                 |
| <b>c. No, medication should not be added directly to an enteral feeding formula</b>   |                 |
| d. I do not know  |                 |
| <b>9. What is the recommended procedure regarding enteral feeding when medication needs to be administered?</b>   | <b>33 (31%)</b> |
| a. Administration of the enteral feeding can be continued during medication administration  |                 |
| b. The enteral feeding only needs to be stopped before medication administration  |                 |
| <b>c. The enteral feeding needs to be stopped, and the feeding tube needs to be flushed before medication is administered</b>                                       |                 |
| f. I do not know  |                 |
| <b>10. When administering medication through an enteral feeding tube, the enteral feeding tube needs to be flushed ..... (complete) (multiple answers possible)</b> | <b>10 (10%)</b> |
| a. before medication administration   | 26 (25%)        |
| <b>b. between every medication administration (in case of multiple drugs administered at the same moment)</b>   | <b>32 (30%)</b> |
| c. after medication administration  | 45 (43%)        |
| d. I do not know  |                 |
| <b>11. The preferred flush solution for an enteral feeding tube is .....</b>  | <b>83 (79%)</b> |
| a. Cola   |                 |
| <b>b. Water</b>   |                 |
| c. Orange juice   |                 |
| d. Enteral feeding  |                 |
| e. I do not know  |                 |
| <b>12. What is the minimum volume of flush solution needed to flush the enteral feeding tube?</b>   | <b>31 (30%)</b> |
| a. 5 mL   |                 |
| <b>b. 15 mL</b>   |                 |
| c. The quantity does not matter   |                 |
| d. I do not know  |                 |
| <b>13. When administering medication through an enteral feeding tube, should the patient's backrest be elevated?</b>  | <b>11 (10%)</b> |
| a. No, that is not necessary  |                 |
| b. Yes, the backrest should be elevated to an angle of at least 10°   |                 |
| <b>c. Yes, the backrest should be elevated to an angle of at least 30°</b>  |                 |
| d. Yes, the backrest should be elevated to an angle of 90°  |                 |
| e. Yes, the backrest should be elevated, but I do not know to which angle   |                 |
| f. I do not know  |                 |

|  |                 |
|--|-----------------|
| <b>14. Which of the following drugs can have a decreased bioavailability when administered through a jejunostomy tube? (multiple answers possible)</b>                     | <b>1 (1%)</b>   |
| a. Ketoconazol   | 15 (14%)        |
| b. Depakine® (valproic acid)   |                 |
| c. Cefalexine (Keforal®)   | 4 (4%)          |
| d. Iron  | 24 (23%)        |
| e. I do not know   |                 |
| <b>15. What would you recommend when a patient asks you how to unclog an enteral feeding tube that is clogged after medication was administered? (open-ended question)</b> |                 |
| <b>Flush tube with water</b>   | <b>36 (34%)</b> |
| Flush tube with other fluids than water  | 5 (5%)          |
| Replace tube   | 4 (4%)          |
| Consult other professionals for advice   | 23 (22%)        |
| I do not know  | 37 (35%)        |



